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ABSTRACT

This project investigated the relationship between Air Force Officer Qualifying Test (AFOQT) composite scores and student performance in Air Force air weapons controller training. The purpose of this study was to examine the feasibility of using AFOQT scores as one selection criteria for entry to the air weapons controller field. An analysis of training performance data for 968 students showed a significant positive correlation between AFOQT Academic Aptitude composite scores and successful completion of training. Thus, a range of possible minimum cutoff scores on this composite was recommended as a selection criterion. Data concerning the approximate cost of attrition rates (Fiscal Year 1982) for the five air weapons controller training organizations and the expected effects of establishing various minimum selection criteria were also presented. A separate data analysis of demographic factors, including age and source of commission showed no consistent relationship between these variables and student performance that would be useful in establishing criteria based on these variables. The decision to use AFOQT scores as one of the selection criteria is now under management review at Air Force Headquarters. (Author)

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AIR FORCE HUMAN RESOURCES LABORATORY

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RELATIONSHIP BETWEEN AIR FORCE OFFICER QUALIFYING TEST SCORES AND SUCCESS IN AIR WEAPONS CONTROLLER TRAINING

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This report has been reviewed and is approved for publication.

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Manpower and Personnel Division

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This project investigated the relationship between Air Force Officer Qualifying Test (AFOQT) composite scores and student performance in Air Force air weapons controller training. The purpose of this study was to examine the feasibility of using AFOQT scores as one of the selection criteria for entry to the air weapons controller field. An analysis of training performance data for 968 students showed a significant positive correlation between AFOQT Academic Aptitude composite scores and successful completion of training. Thus, a range of possible minimum cutoff scores on this composite was recommended as a selection criterion. Data concerning the approximate cost of attrition rates (Fiscal Year 1982) for the five air weapons controller training organizations and the expected effects of establishing various minimum selection criteria were also presented. A separate data analysis of demographic factors, including age, and source of commission showed no consistent relationship between these variables and student performance that would be useful in establishing criteria based on these variables. The decision to use AFOQT scores as one of the selection criteria is now under management review at Air Force Headquarters.

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SUMMARY

Comments from training and operational personnel over the past few years have indicated that an unacceptably large number of air weapons controllers (AFSC 17XX) are not performing satisfactorily during training and/or in their field assignments. Over FYs 80, 81, and 82 training attrition rates in the eight air weapons controller courses have varied from 0% to 41%; the general trend was increasing attrition rates from FY 80 through FY 82.

The primary objective of this study was development of a selection strategy, based on Air Force Officer Qualifying Test (AFOQT) scores, for the air weapons controller career field. In addition, it explored performance differences attributable to background factors and documented aptitude levels of personnel currently assigned to AFSC 17XX.

Data concerning the cost of FY 82 attritions in training dollars to the air weapons controller training organizations were analyzed and presented in the report. An analysis of training performance data on 968 air weapons controller students found a significant and positive relationship between AFOQT Academic Aptitude composite scores and successful completion of training. These data were brought together in a set of analyses to show impact on training dollars lost through attrition if various cut-off scores on the Academic Aptitude of the AFOQT were employed as a prerequisite for course entry. A separate analysis of background factors, including age and source of commission, found no useful relationship between these variables and student performance.

It was recommended that the AFOQT be used as a screening device for entry into air weapons controller training.

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TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
	Objective	1
	Background	1
	Issues	1
	Related Research	3
II.	APPROACH	3
	Method	3
	Data Analysis	4
III.	RESULTS	4
	AFOQT and Student Performance	4
	Demographic Factors and Student Performance	8
IV.	RECOMMENDATIONS	10
	REFERENCE NOTES	11
	REFERENCES	12
	APPENDIX A: 17XX TRAINING ORGANIZATIONS AND COURSES	13

LIST OF FIGURES

Figure		Page
1	AFOQT Academic Aptitude Scores and Cumulative Percent - Graduates Versus Attritions in AFSC 1741 Training	5
2	AFOQT Academic Aptitude Scores and Percent Graduates Versus Attritions in AFSC 1741 Training	6

RELATIONSHIP BETWEEN AIR FORCE OFFICER QUALIFYING TEST SCORES AND SUCCESS IN AIR WEAPONS CONTROLLER TRAINING

I. INTRODUCTION

Objective

The primary objective of this study was development of a selection strategy for the air weapons controller Air Force Specialty Code (AFSC) 17XX career field based on the Air Force Officer Qualifying Test (AFOQT). At the present time, this career field has no special selection criterion. The secondary objectives were as follows:

1. To investigate relationships between AFOQT composites and various measures of training success.

2. To determine training performance differences attributable to background and bio-demographic factors.

3. To document current aptitude levels of personnel assigned to this career field.

Background

Over the past several years there has been growing concern about the need for selection criteria for personnel entering the air weapons controller (AFSC 17XX) career field. Comments from training and operational personnel during the past few years have indicated that personnel entering this career field have not been performing well either during training or in their field assignments. These concerns have been documented in several letters and reports (see Reference Note 1).

Issues

Table 1 shows the attrition rates and associated costs for the five air weapons controller training schools (eight courses) for fiscal years 1980 through 1982. As can be seen from this table, the attrition rates differ widely for each school and are not stable over the years covered. In fact, they range from a low of 0% attrition to a high of 41% attrition. However, it should be noticed that the rates generally increased for the 3 year period covered, especially for the more important courses.

The estimated FY82 attrition costs presented in Table 1 are considered to span the range from extremely conservative (per course-minimum) to liberal (per course-maximum), with the actual costs falling somewhere within this range. Of the 537 students who entered air weapons controller training programs in FY82, 88 were eliminated during training. This 16% attrition rate cost the Air Force between 2.3 and 4.6 million dollars in wasted training. Although the acceptability of this cost must be determined by HQ USAF and the Major Commands (MAJCOMs), establishment of a selection criterion for the 17XX career field appears to be warranted.

Another major issue relevant to this career field is the level of competence of the students once they graduate from the training courses and perform their operational jobs throughout their careers. At the present time, there is no valid empirical methodology, nor adequate detailed job performance data, that can be used to correlate student performance during training with their later operational job performance. MAJCOM Standardization and Evaluation programs do provide some data concerning operational performance and are designed to ensure the operational competence of career field members. However, many factors may affect performance on these assessments, such as unit mission and tasking, training provided after formal schooling is completed, etc. Because of these factors, data from these assessments cannot be used to develop correlations between performance during training and performance in the field. Implementing an adequate selection criterion, however, can be expected to have a positive effect on the operational performance of air weapons controllers.

Headquarters USAF requested the Air Force Human Resources Laboratory to investigate the possibility of recommending minimum cutoff scores on the AFOQT as a selection criterion for entrance into this career field (see Reference Note 2). The AFOQT was chosen because it is given to all potential officers (except Air Force Academy graduates) and would not impose additional testing costs.

Related Research

Most of the previous research on selection criteria relevant to air weapons controllers has been done by the Federal Aviation Administration (FAA) for selecting Air Traffic Control Specialists (ATCSs). The FAA has experimented with various test batteries for ATCS selection since 1962. A review of the experience that the FAA has had with their various selection criteria from 1960 to 1980 can be found in Collins, Boone, and VanDeventer (1981). Other articles that describe FAA selection criteria research include Boone, VanBuskirk and Steen (1980), Cobb (1971), Cobb and Mathews (1973), Lewis (1978), and Mathews and Cobb (1974).

In one of the studies most relevant to air weapons controller selection policy, Cobb (1971) assessed the usefulness of seven previously validated, commercially available tests in predicting success in military ATCS training. Although the composite test scores predicted success somewhat better than the military aptitude screening measures in use at the time (primarily, the Air Force General Aptitude Index and the Marine Corps Military Screening and Classification Test), Cobb concluded that the military could significantly improve its selection procedures by merely raising the minimum scores required on existing military screening tests.

II. APPROACH

Method

A questionnaire was developed to acquire information on course content and duration, to identify students, and to obtain student performance data, such as academic grades, class standing, and an indication of whether or not the student completed the course. This questionnaire was sent to each of the five organizations responsible for training air weapons controllers (see Appendix). Each of these schools was asked to provide data for all students enrolled from 1 October 1979 through 1 July 1979.

Predictor data were obtained for the students identified in the questionnaires by retrieving their AFOQT scores from the AFOQT consolidated data base. The composites were Pilot, Navigator-Technical, Academic Aptitude, Verbal, and Quantitative.

Table 2 shows that all of the AFOQT composites were able to predict student performance using the performance criteria that were chosen for this study. However, each of the composites yielded a different quantitative value. A closer examination of the data shows that the AFOQT Academic Aptitude composite had the most consistently high correlation with student performance and, thus, would be the best single predictor of student performance.

Figures 1 and 2 graphically show the relationship between the AFOQT Academic Aptitude composite and success or failure in training. As can be seen from these figures, students who failed to complete their training had lower scores on the AFOQT Academic Aptitude composite than those who completed their training. In Figure 1, the steeper slope of the attrition line below the 35th percentile shows that a higher percentage of attritions (compared to the percentage of graduates) occurred at the lower AFOQT academic aptitude scores. Figure 2 shows more specifically that, below the 35th percentile, there were more attritions than completions, while above the 60th percentile the reverse is true. There appears to be only a minimal difference in Academic Aptitude composite scores between those who failed in training and those who completed training for scores between the 35th and 60th percentiles.

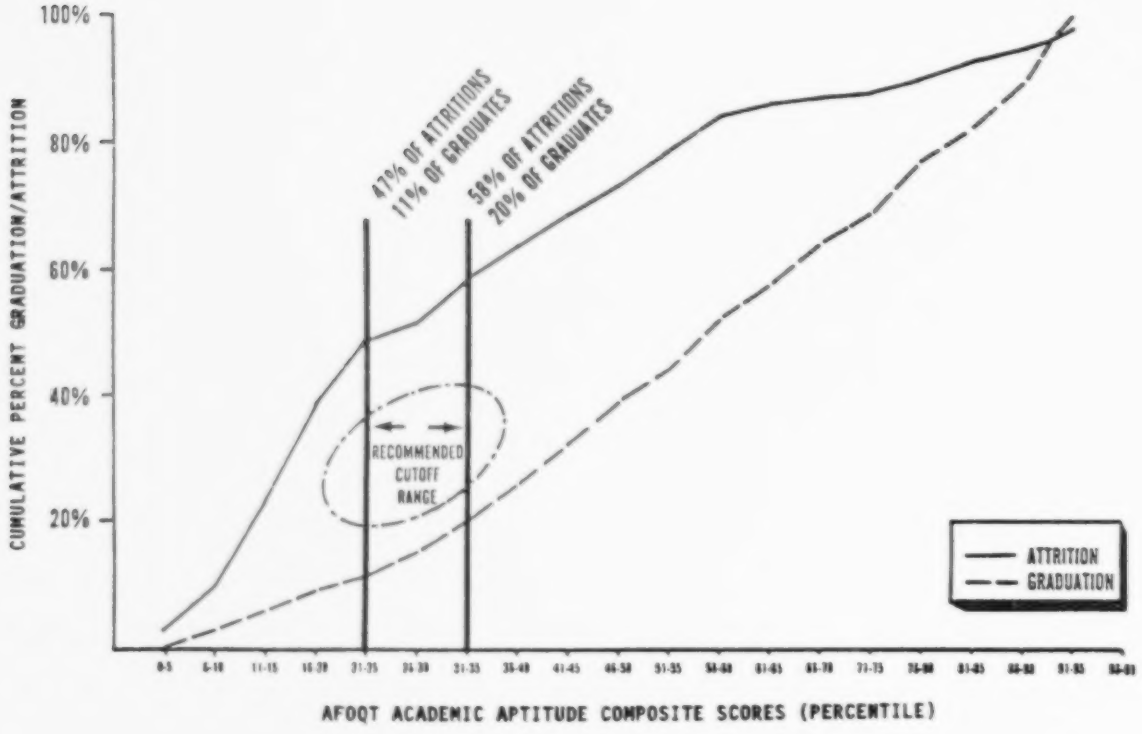

Figure 1. AFOQT academic aptitude scores and cumulative percent graduates versus attritions in AFSC 1741 training.

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Table 3. AFOQT Academic Aptitude Scores and Success in AFSC 1741 Training (Successive Percentile Blocks)

AFOQT Academic Aptitude Composite Score	Possible Cutoff Scores	% Graduated	% Not Graduated[a]	Difference
01-05		1	3	-2
06-10		2	6	-4
11-15		3	14	-11
16-20		3	11	-8
	Recommended Minimum Cutoff Range			
21-25	25	2	6	-4
26-30	30	4	7	-3
31-35	35	5	11	-6
36-40		6	5	+1
41-45		6	6	0
46-50		7	4	+3
51-55		5	5	0
56-60		8	6	+2
61-65		5	2	+3
66-70		7	1	+6
71-75		5	1	+4
76-80		8	3	+5
81-85		5	2	+3
86-90		7	2	+5
91-95		7	1	+6
96-99		4	1	+3

[a]Because of the rounding error involved in this calculation, this column only totals 97%. It does, however, include all of the appropriate data.

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Table 5. Correlation of Demographic Variables with AFSC 1741 Training Performance Data - Total Group Input

Criterion	Age In Years	Source of Commissioning[a]	Mean	SD	N
Academic Grade	.117	-.092*	93.90	4.82	1186
Success[b]	.160**	-.152*	.9154	.2885	1453
Student Class Rank	.030	.143**	.5099	.2910	941
Mean (Grads + Eliminees)	26.65	.630			
SD (Grads + Eliminees)	3.17	.499			
N	156	577			

*Significant at .05 level

**Significant at .01 level.

[a]Source of commission was coded: 0=OTS, 1=ROTC.

[b]Success was coded: 0=FAIL, 1=PASS.

A separate analysis was done to answer the question concerning whether students in these training programs who had previously been eliminated from undergraduate pilot training (UPT) performed as well as the students without this particular background. The obtained success rates were 91% for both groups.

Table 6 provides data concerning how well students in the air weapons controller training programs performed on the AFOQT Verbal, Quantitative, and Academic Aptitude composites, as compared to personnel in several other career fields. Although the average scores for the air weapons controller sample are somewhat lower than the scores for the other career fields listed, they are higher than those obtained for the Air Force-wide officer population. This table indicates that the 17XX career field is receiving students whose abilities are roughly comparable to those of other critical career fields. Adoption of a selection criterion such as that presented in this report would result in an increase in the average composite scores for the 17XX population. More importantly, it would lower the training program attrition rate, assuming that there were no changes in the school attrition rate policies. Whether to adopt a selection criterion for this career field can be determined only by a high-level management review and decision process aimed at a policy that would provide an adequate number of proficiently trained and operationally qualified air weapons controllers, while minimizing the attrition-related costs.

Table 6. Mean AFOQT Composite Scores - Air Weapons Controllers (AFSC 1741) vs. Other Career Fields

	N	Verbal	Quantitative	Academic Aptitude
UPT	2680	67.2	68.6	68.1
AFSC 51XX	178	62.4	62.4	67.0
UNT	787	62.4	65.5	66.5
AFSC 17XX[a]	968	60.4	49.9	56.0
AF-Wide		47.4	45.3	45.2

[a]These means are only for the 17XX students included in this study.

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REFERENCE NOTES

1. The following letters and reports document concern regarding lack of specific selection criteria for the air weapons controller career field:

   Gaglio, S. S. (1981, August). Survey of S. I. A. Unpublished manuscript, 2625 Technical Training Squadron, Tyndall AFB, FL 32403-5000.

   Lee, R. J. (1981, September). Letter re: APQ student elimination, FY81. From USAF Interceptor Weapons School/TQTA to USAF Interceptor Weapons School/CC, Tyndall AFB, FL 32403-5000.

   North, J. C. (1979, May). Letter re: Minutes of AFHRL/552 AWACW meeting concerning weapons director selection study. From HQ 552D Airborne Warning and Control Wing, 552 AWACW/DOP, to meeting participants.

   Pahls, G. (1981, April). Memo for Record re: Analysis of entry level weapons controller training for FY80. USAF Interceptor Weapons School, USAF IWS/TT, Tyndall AFB, FL 32403-5000.

   Rothe, M. A., Granade, B. T., Jr., Savana, M. J., Jr., Gaglio, S. S., & Stockmaster, M. (1980, October). Analysis of weapons controller course eliminees. Unpublished manuscript, Capt Ben Granade, 3625 Technical Training Squadron, Tyndall AFB, FL 32403-5000.

2. A meeting of representatives from the training and air weapons controller career management communities and Air Force Headquarters (USAF/XOORC) was held on 29 and 30 Sep 1981 at Wright-Patterson AFB, OH. The purpose of the meeting was to consider alternative solutions to air weapons controller training cost and attrition rate issues. Four options were discussed: (a) raise performance standards (and, thereby, the attrition rates in the basic schools), to decrease downstream attrition and minimize the number of "marginal performers" who enter operational units; (b) establish minimum aptitude entrance standards; (c) use a combination of the first two alternatives; and (d) generate a Request for Personnel Research for AFHRL development of a special selection test battery for this career field. The last option involved the investigation of a psychomotor device previously developed for pilot selection, the development of experimental paper-and-pencil tests, or the development of a totally new psychomotor device. Those attending the meeting chose Option b.

3. Some of the training school representatives requested consideration of data on sex and race as possible predictors of training performance. These data were collected, but are not presented because their use as selection criteria is not feasible. Analysis of these data indicate that neither race nor sex had consistently significant correlations with training program performance.

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APPENDIX A: 17XX TRAINING ORGANIZATIONS AND COURSES

A. 3625 Technical Training Squadron, Tyndall AFB, FL (Air Training Command)

1. E30BP-1741X-000 Air Weapons Controller Fundamentals - 6-week training course for personnel initially entering the career field for later assignment to automated operational units.

2. E30BP-1741A-003 Air Weapons Controller Fundamentals Manual. 13-week course for personnel initially entering the career field for later assignment to manual operational units.

B. USAF Interceptor Weapons School, Tyndall AFB, FL (Tactical Air Command)

1741B00 -- 10-week course for students who have completed basic manual system training. Provides automatic positionally qualified (APQ) training as intermediate training for students transitioning into units with automatic equipment (SAGE/BUIC/AWACS).

C. 966 Airborne Warning and Control Squadron, Tinker AFB, OK (Tactical Air Command)

1. E3A00C00BX -- 18-week training program for AWACS Senior Directors/ Mission Crew Commanders.

2. E3A00C00DX -- 24-week training program for AWACS Weapons Directors.

3. E3A00C00GX -- 19-week training program for AWACS Air Surveillance Officers.

D. 4950 Technical Training Wing, Keesler AFB, MS (Air Training Command)

30LR1741D-002 -- 8-week training program in Electronic Counter- Counter Measures (ECCM)

E. 607 Technical Training Squadron, Luke AFB, AZ (Tactical Air Command)

1741-FOL -- 7-week training program in automated 407L radar system for students being assigned to operational units with this equipment.

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